

REMARKS

I. Status of the Application

Claims 1-82 are all the claims pending in the Application. Claims 3, 13-29, 32 and 42-82 are withdrawn from consideration. Claims 1-2, 4-12, 30-31 and 33-41 have been rejected.

The present Response addresses each point of objection and rejection raised by the Examiner. Favorable reconsideration is respectfully requested.

II. Formalities

Applicant thanks the Examiner for acknowledging the claim for priority under 35 U.S.C. § 119 and for acknowledging receipt of the certified copy of the priority document submitted on October 17, 2003.

Applicant thanks the Examiner for indicating that the Formal Drawings filed on July 18, 2003 are accepted.

The Examiner has withdrawn the previous Final Office Action mailed November 6, 2008, and has restarted the period for response.

In the previous Office Action mailed November 6, 2008, the Examiner returned the initialed PTO/SB/08 filed with the Information Disclosure Statement June 25, 2008. The Examiner has returned the same PTO/SB/08 with this Office Action, but has crossed-out all of the cited references. Applicant respectfully requests that the Examiner confirm on the official record that the references cited with the Information Disclosure Statement June 25, 2008 have been considered.

III. Claim Rejections Under 35 U.S.C. § 112

Claims 1, 22 and 30 (and all dependent claims) are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Examiner alleges that the claims recite a spectral shaper stage that estimates an acoustic echo component. The Examiner alleges that it is not clear how this echo component would be any different than the echo estimate being input into the device and that there would have been no need to re-estimate the echo when it has already been estimated by the echo canceller stage. Applicant respectfully traverses these rejections for *at least* the reasons set forth below.

As an initial matter, Applicant notes that claim 22 has been withdrawn.

Further, MPEP §2173.02 specifies that “[t]he requirement to ‘distinctly’ claim means that the claim must have a meaning discernible to one of ordinary skill in the art when construed according to correct principles. Further, MPEP §2173.02 mandates that the Examiner should allow claims which define the patentable subject matter with a reasonable degree of particularity and distinctness. As explained in detail below, claims 1, 22 and 30 define the claimed invention with a reasonable degree of particularity and distinctness when these claims are construed according to correct principles in light of the specification¹. Therefore, claims 1, 22 and 30 (and all dependent claims) satisfy the requirements of 35 U.S.C. § 112.

¹ See e.g., MPEP §2111.01

First, Applicant notes that that none of the pending claims 1, 22 and 30 recite the feature of “a spectral shaper stage,” as alleged by the grounds of rejection. Thus, the grounds of rejection are improper for *at least* these reasons.

Second, the Examiner alleges that “it is not clear how this echo component would be any different than the echo estimate being input into the device.” However, none of the pending claims 1, 22 and 30 recite the feature of “the echo estimate being input into the device.” Indeed, none of claims 1, 22 and 30 even recite the feature of “the device” much less the feature of “the echo estimate.” Accordingly, the grounds of rejection are improper for *at least* these additional reasons.

Third, claim 1 plainly recites the feature of “a spectral shaper” and the meaning of these terms would be readily discernable to one of ordinary skill in the art from the plain language of the claim 1 alone. For instance, claim 1 makes clear that the spectral shaper is for estimating an acoustic echo component by modifying a second input signal. Claim 1 also makes clear that the spectral shaper is for receiving an echo replica (produced by an echo canceller) as the second input signal.

The Examiner alleges that it is not clear how this echo component (i.e., the recited “acoustic echo component”) would be any different than the echo estimate being input into the device. However, in sharp contrast to the Examiner’s allegations, claim 1 clearly states that the acoustic echo component is, in fact, different than the received echo replica. To this effect, claim 1 plainly recites the features of estimating said acoustic echo component by modifying said second input signal (i.e., the received echo replica). Thus, claim 1 explicitly states that the estimated acoustic echo component is different than the received echo replica in that the acoustic

echo component is estimated by modifying the received echo replica. Accordingly, the meaning of the terms recited in claim 1 would have been readily discernable to one of ordinary skill in the art from the plain language alone.

Fourth, when claim 1 is properly construed in light of the specification, the meaning of claim 1 would have been readily discernable to one of ordinary skill in the art. In particular, contrary to the grounds of rejection, it would have been clear in light of the specification how the recited “acoustic echo component” would be different than the echo replica received from the echo canceller 3. For example, as explained in the present specification, the linear echo canceller 3 uses a replica of the transfer function of the acoustic echo path to produce an echo replica (page 1, lines 22-24). In contrast, the specification describes that the nonlinear characteristics of practical systems are of such a magnitude that the linear echo canceller cannot completely replicate the transfer function of nonlinear acoustic echo path (page 2, lines 13-25).

Accordingly, consistent with one illustrative embodiment of the claimed invention, the spectral shaper is configured as a spectral subtractor 10, which performs nonlinear calculations in the frequency domain and compensates for nonlinear distortion of the echo channel in the acoustic path (page 6, lines 5-10; page 9, lines 15-21). For instance, as would have been clear to a skilled artisan from FIG. 3, the spectral subtractor 10 includes Fourier transform converters 11 and 12, which perform M-point Fourier transform calculations on its input from the echo canceller 3 (page 6, line 11 – page 9, line 14 and FIG. 3). Thus, in the time domain, the linear echo canceller performs operations complementarily to the operation of the spectral shaper (page 9, lines 15-21). This is but one example of how the estimated acoustic echo component is different than the input received from the echo canceller 3.

Fourth, the Examiner alleges that “[t]here would be no need to re-estimate the echo when it has already been estimated by the echo canceller stage.” Again, Applicant respectfully disagrees. As explained repeatedly throughout the specification, numerous advantages may be achieved by the claimed spectral shaper. For example, according to one illustrative embodiment, the spectral shaper is configured as a spectral subtractor and, even if the linear echo canceller 3 makes an error in the echo path estimation, resulting in a residual echo at the output of subtractor 4, the spectral subtractor can remove such a residual echo. (page 6, lines 11-12; page 11, lines 9-14). Further, as explained in the present specification, the use of the spectral subtractor in combination with the linear echo canceller 3 enables its adaptive filter 7 to operate with a reduced number of delay-line taps and, hence, the amount of computations can be decreased. In the prior art, where the linear echo canceller is used exclusively, a reduction of the delay-line taps inevitably results in a significant decrease in the amount of echo that can be cancelled. Thus, when claim 1 is properly read in light of the specification, one of ordinary skill in the art would readily discern the need for a spectral shaper for estimating said acoustic echo component, as recited in claim 1.

Indeed, the Examiner seems to be asking why it is necessary for the spectral shaper to perform echo re-estimation in spite of the fact that the echo canceller has already performed echo estimation to produce an echo replica. In response, Applicant respectfully points out that the echo canceller’s estimation is based on linear echo estimation, whereas the spectral shaper’s estimation is based on nonlinear echo estimation. In this regard, the specification discusses the issues of nonlinearity and linearity for echo estimation, for example, on page 2, lines 13-25.

Since claim 1 defines the patentable subject matter with a reasonable degree of particularity and distinctness, the Examiner should allow claim 1 for *at least* these reasons. Further, in view of the similarity between the recitations of claim 1 and the recitations of claim 30, arguments analogous to the foregoing arguments as to the patentability of independent claim 1 demonstrate the patentability of claim 30. As such, claim 30 satisfies the requirements of 35 U.S.C. § 112 *at least* for reasons analogous to those presented above. Further, Applicant submits that the dependent claims 2, 4-12, 31 and 33-41 are allowable *at least* by virtue of their dependency on claims 1 and 30, respectively. Thus, the allowance of these claims is respectfully solicited of the Examiner.

In addition, with respect to claim 30, the Examiner alleges that “it is not clear where the ‘receiving’ is being performed in the claimed device” and that “[t]he step appears to be combining steps performed by the echo canceling stage and the spectral shaper stage and is not clear. Applicant respectfully disagrees with the grounds of rejection.

Claim 30 is directed to a method of suppressing acoustic echo and there is no requirement in 35 U.S.C. § 112, second paragraph, stating that claim 30 must explicitly recite where the receiving operation is being performed in the claimed device. To the contrary, 35 U.S.C. § 112, second paragraph, requires only that the claim must have a meaning discernible to one of ordinary skill in the art when construed according to correct principles (*see e.g.* MPEP §2173.02). Since the meaning of “receiving one of said near-end signal and said residual echo as a first input signal, receiving said echo replica as a second input signal, and estimating said acoustic echo component by modifying said echo replica,” would have been readily discernable

to one of ordinary skill in the art when construed according to correct principles, claim 30 satisfies the requirements of 35 U.S.C. § 112, second paragraph, for *at least* these reasons.

Further, contrary to the grounds of rejection, when claim 30 is properly construed in light of the specification, one of ordinary skill in the art would readily discern where the “receiving” step is being performed, for instance, according to one illustrative embodiment, the receiving operation of claim 30 can be performed by the spectral shaper. The specification explains that, according to one illustrative embodiment, the spectral shaper 10 is implemented as a spectral subtractor, which receives a first input signal either from subtractor 4 or microphone 1 and a second input signal from linear echo canceller 3 (*see e.g.*, page 5, line 12 – page 6, line 22; FIGS. 2-3). Further, as explained in the present specification, Fourier transform converter 12 performs M-point Fourier transform calculations on its input signal from the echo canceller 3.

Therefore, the meaning of claim 30 would have been readily discernible to one of ordinary skill in the art when construed according to correct principles and, thus, satisfies the requirements of 35 U.S.C. § 112 for *at least* these reasons. Moreover, the dependent claims 31 and 33-41 are allowable *at least* by virtue of their dependency on claim 30.

IV. Claim Rejections Under 35 U.S.C. § 103

The Examiner has rejected claims 1-2, 5, 30-31 and 34 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,510,224 to Christensson et al. (hereinafter “Christensson”). Claims 5 and 34 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Christensson and further in view of newly cited U.S. Patent No. 5,937,060 to Oh (hereinafter “Oh”). Applicant respectfully traverses these rejections for *at least* the reasons set forth below.

The Examiner was not persuaded by the arguments advanced with the Response filed on June 30, 2008. In response to such arguments, the Examiner merely notes the rejections under 35 U.S.C. § 112 discussed above. However, as explained in detail above, claim 1 satisfies the requirements of 35 U.S.C. § 112. Therefore, Applicant's previous arguments remain un rebutted and the pending claims are allowable for *at least* the reasons already of record.

Specifically, Christensson fails to teach or suggest that the near-end enhancement spectrum generator 309 therein receives the error signal $e(n)$ (i.e., the alleged residual echo) as a second input signal and estimates an acoustic echo component by modifying the received error signal $e(n)$, as required by claim 1. Christensson also fails to teach or suggest that the near-end enhancement spectrum generator 309 receives one of the near-end signal and estimated echo signal $y(n)$ (i.e., the alleged echo replica) as a first input signal and, then, shapes a spectrum of one of said near-end signal and estimated echo signal $y(n)$ with the estimated acoustic echo component, which was estimated by modifying the received error signal $e(n)$, as further required by claim 1. Therefore, claim 1 is patentable over the cited references for *at least* these reasons.

Secondly, in response to Applicant's previous arguments that the cited references fail to teach or suggest the claimed spectral shaper, the grounds of rejection allege that it is not clear how to discern from what is estimated by the spectral shaping stage and what is estimated by the echo canceling stage.

Applicant respectfully disagrees with the grounds of rejection and submits that one of ordinary skill in the art would readily discern, from a careful reading of the pending claims in light of the specification, that the linear echo canceller 3 uses a replica of the transfer function of the acoustic echo path to produce an echo replica (page 1, lines 22-24). On the other hand, a

skilled artisan would also readily discern that, according to one illustrative embodiment, the spectral shaper performs nonlinear calculations in the frequency domain and compensates for nonlinear distortion of the echo channel in the acoustic path (page 6, lines 5-10; page 9, lines 15-21). As such, a skilled artisan would readily discern that, in the time domain, the linear echo canceller performs operations complementarily to the operation of the spectral shaper (page 9, lines 15-21).

Therefore, Applicant submits that claims 1-2, 5, 30-31 and 34 and claims 5 and 34 are patentable over the cited references for *at least* these reasons and respectfully requests that the Examiner withdraw these rejections.

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

RESPONSE UNDER 37 C.F.R. § 1.111
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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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